TROPICAL DISEASES BUREAU.

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DISEASES DUE TO PROTOZOAN PARASITES.

HOARE (Cecil A.). **An Experimental Study of the Sheep-Trypanosome (*T. melophagium* Flu, 1908), and its Transmission by the Sheep-Ked (*Melophagus ovinus* L.).**—*Parasitology*, 1923. Nov. Vol. 15. No. 4. pp. 365–424. With 5 plates and 5 text figs.

The present paper deals *in extenso* with the author's investigations regarding the occurrence of a trypanosome in sheep in England.

An earlier and less detailed publication has already been noted in this *Bulletin* (Vol. 10, no. 4, Nov. 1922, pp. 107–108).

The present paper is divided into 12 parts dealing with the following aspects of the work: 1. Historical survey; 2. Anatomy and biology of the Sheep Ked; 3. Technique employed; 4. The Incidence of the parasite in the Sheep; 5. Transmission of the parasite; 6. *T. melophagium* in the vertebrate host; 7. *T. melophagium* in the invertebrate host; 8. Cultivation of *T. melophagium*; 9. Animal experiments; 10. Affinities of *T. melophagium*; 11. Summary; and 12. Appendix.

It is impracticable to deal adequately with this long paper in an abstract, and for detailed information the original must be consulted. It is convenient to reproduce the author's summary.

Trypanosoma melophagium Flu, 1908, is a parasite of European domestic sheep (*Ovis aries* L.) in the blood of which it occurs in very scanty numbers and can be detected by the cultural method. In England it has been found in 80 per cent. of the sheep examined. The infection is of fairly short duration and does not produce an immunity in sheep, since the latter can easily be re-infected. In all probability *T. melophagium* produces no pathological effect in sheep, and is incapable of infecting laboratory animals.

Morphologically the sheep trypanosome is closely allied to the cattle trypanosome, *T. theileri*.

The intermediate host of *T. melophagium* is the sheep-ked, *Melophagus ovinus* L., in the alimentary canal of which it passes through a definite cycle of development ending in the production of infective forms (metacyclic trypanosomes) in the hind-gut of the insect.

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The mode of transmission is contaminative, the sheep acquiring the infection by ingesting the ked. Infection of sheep did not result from the bite of the ked, through abrasions of the skin, or from inoculation of cultures of the trypanosome.

T. melophagium is easily cultivated at 30° C. Its evolution in cultures is similar to that in the invertebrate host.

BRUMPT (E.). **Description de deux trypanosomes nouveaux : *T. sergenti* et *T. parroti* du *Discoglossus pictus*.** [Two New Trypanosomes, *T. sergenti* and *T. parroti* of *Discoglossus pictus*.]—*Ann. Parasit. Humaine et Comparée.* Paris. 1923. Oct. Vol. 1. No. 4. pp. 337–341. With 2 text figs.

The author describes two recognisably distinct trypanosomes found in the blood of a young specimen of *Discoglossus pictus* in Algeria. Trypanosomes have not been observed previously in the blood of this species.

T. sergenti has a somewhat pyriform body, the rounded end of which is posterior. There is a poorly developed undulating membrane and a fairly long free flagellum. The over-all length ranges from 30 to 50 μ, and the breadth from 6–12 μ. The nucleus is oval in shape and lies sometimes transversely and sometimes longitudinally. There is generally a clear space anterior to and close to the nucleus. The blepharoplast is subterminal in stained preparations and oval in shape. It is placed transversely across the termination of the flagellum. Attempts at cultivation in artificial media have so far failed.

T. parroti. This is a very motile trypanosome, but its motility involves little or no translation. The parasite is very variable in size. Six fixed specimens measured from 54 to 78 μ in length. The cytoplasm is either hyalin or shows fine purple granules. The parasite is very fragile. The nucleus is composed of a collection of granules, is oval in shape and longitudinally placed. The blepharoplast is transversely elongated or sometimes reniform. Multiplication forms have not been seen on either species.

VAN SACEGHEM (R.). **Le pouvoir empêchant dans les trypanosomiases.** [Inhibition in Trypanosomiasis.]—*Bull. Soc. Path. Exot.* 1923. Dec. 12. Vol. 16. No. 10. pp. 733–735.

By his expression " le pouvoir empêchant " the author designates a property developed in animals which has an inhibitory action upon the multiplication of trypanosomes *in vivo*. The property tends to change pathogenic trypanosomes into commensals. It is developed with especial rapidity in wild animals, and in some cases in domesticated animals.

In trypanosomiasis a kind of balance is often struck between the animal and the parasite with the result that while the animal has to all intents and purposes recovered, the recovery is not complete in that the trypanosomes persist although causing no actual disease. This condition differs markedly from that found in most bacterial diseases. In some species the inhibitory power is developed very slowly, as for example in cattle infected with *T. congolense*. By suitable medicinal treatment infected cattle can be kept alive sufficiently long for the development of the inhibitory power to take place.

Even in animals in which a radical cure appears to have been obtained it not infrequently happens that even after a lapse of years the persistence of trypanosomes can be established.

KÜHNE (M.). **Die Beschälseuche in der Altmark 1922-1923.** [Dourine in Altmark 1922–23.]—*Arch. f. Wissen. u. Prakt. Tierheilk.* 1923. Vol. 50. No. 3. pp. 283–291.

The author gives details of an extensive outbreak of dourine during the years 1922–1923.

It is interesting to note that the author has seen a case of dourine in a foal eighteen months old. In this case infection could not have been contracted by coitus. It does not appear that a definite diagnosis was arrived at. He thinks that the transmission was by " contact."

LEYNEN (E.). **La durina.** [Dourine.]—*Revist. de Hig. y. Sanidad Pecuarias.* 1924. Jan. Vol. 14. No. 1. pp. 1–14. With 12 text figs.

This paper appears to be in the nature of a review of the existing knowledge regarding the clinical aspects of the disease.

BAROTTE & BALOZET. **Application pratique au Maroc de la déviation du complément dans le diagnostic de la dourine.** [The Practical Application of the Complement Fixation Test to the Diagnosis of Dourine in Morocco.]—*Bull. Soc. Path. Exot.* 1924. Jan. 9. Vol. 17. No. 1. pp. 27–32.

Trypanosome extracts prepared by WATSON's technique are used as antigen. It is important to bleed the animals when the blood invasion is at its maximum. This, the authors find, is about the 40th hour after inoculation, but there is some variation. The authors have found that 15 per 1,000 is a satisfactory strength of citrate solution for mixing with the blood prior to centrifuging for the collection of the trypanosomes. There need be no fear of using an excess of this. The centrifuging should not be carried out at a greater rate than 1,200.

It was found that collection of the trypanosomes from the supernatant liquid was facilitated by placing the tubes in an ice chest for 12 hours. As a result of agglomeration they were readily collected by centrifuging.

The antigen was found to be devoid of any anticomplementary property. The authors find that the test is, so to speak, a generic one, and not specific. Its value for diagnosis of dourine in the donkey requires further investigation.

BALOZET. **Contribution à l'étude des réactions de fixation dans la dourine.** [Fixation of the Complement in the Diagnosis of Dourine.]—*Bull. Soc. Path. Exot.* 1924. Jan. 9. Vol. 17. No. 1. pp. 23–27.

In this paper the author describes experiments in which the value of a number of antigens, prepared in different ways, was tested.

Alcoholic extracts of lymphatic glands, heart, liver and oedematous liquid from the abdomen of a dog infected with dourine have been tried. The actual method of carrying out the test is that described by CALMETTE and MASSOL in connection with complement fixation tests for tuberculosis; that is to say, the only factor which is varied is the complement, which has been titrated for the haemolytic system beforehand. A great difficulty was encountered in that even normal dog serum possesses a high anti-complementary titre.

None of the antigens yielded clearly positive results.

KNOWLES (R. H.). **The Formol-Gel Test as applied to Camels affected with** *Trypanosoma soudanense.*— *Jl. Comp. Path. & Therap.* 1924. Mar. Vol. 37. No. 1. pp. 37–44. With 1 text fig.

This test depends upon changes ranging from simple opalescence to gelation taking place in the serum of animals infected with certain diseases upon the addition to it of a small quantity of formalin. The test may be carried out in two ways :—

1. Tube test. Four drops of commercial formalin are added to 1 cc. of suspected serum and mixed thoroughly. The results are read at intervals from 1 to 96 hours afterwards.

2. Slide test. This is a slight modification of the technique employed by FOX and MACKIE in the diagnosis of kala azar. These authors simply placed a drop of serum on a slide and inverted this over a watch glass containing a few drops of formalin. As the reaction with camel serum takes longer three drops of serum were employed, so as to avoid desiccation. In this case observations were carried out every ten minutes. It is advisable to take especial care in obtaining the serum so that it may be as clear as possible. Camel serum is almost colourless and can, with care, be obtained almost as clear as water.

In a tabular statement the author shows the results obtained with the sera of 7 trypanosome infected camels, 12 healthy camels, 2 bulls, and 2 horses. In all the infected camels there was distinct opalescence by the second hour and more or less gelation by the 12th hour. The reaction was obtained irrespective of the presence in or absence of trypanosomes from the blood.

The serum of one of the normal camels yielded doubtful opacity from the 12th hour onwards.

The two bulls were apparently uninfected and were included as a kind of control to HORNBY's observations. The serum of neither showed any opalescence up to 96 hours. The serum of one of the horses showed gelation at 24 hours, and the sera of both were completely gelated at 48 hours. Comparative tests were made using 2 drops and 4 drops of formalin to 1 cc., and the results were clearly in favour of 4 drops being used.

By means of the slide test it was found that opalescence made its appearance in about 10 minutes and that gelation began at about 50 minutes. Normal sera were negative to the test. The author concludes that the test is reliable and that it will be of value in the purchase of camels.

Results of experiments with " Bayer 205 " are to be published later.

MIGONE (L. E.) & OSUNA (T.). **Tratamento do "Mal de cadeiras" dos equideos pelo novo producto Bayer "205."** [The Treatment of "Mal de cadeiras" of Equines by means of the New Product Bayer 205.]—1° *Congresso Nac. Med. Vet. Brazil.* 1922. Sept. Rio de Janeiro. pp. 35–37.

The authors recommend cattle owners to learn how to use the microscope for the prompt and certain diagnosis of Mal de caderas.

Isolation must be practised directly a case is detected. Bayer 205 should be injected intravenously, as by subcutaneous injection inflammation is set up. Healthy animals which have to pass through infected areas should be injected with a protective dose of 2 gm. The curative treatment comprises doses of 2, 3, and 4 gm. at intervals of eight days.

The drug should be given as a 10 per cent. solution in physiological salt solution.

Questions to which answers are still required are:—How long does the immunity conferred by an injection last?; Is it absolutely necessary to give three doses to effect a cure?; Does the serum of cured animals possess any curative properties?

DOUWES (J. B.). **De behandeling van Surra bij Herkauwers met Bayer 205.** [Treatment of Surra in Ruminants with "Bayer 205."] —*Nederl.-Indische Bladen v. Diergeneesk. en Dierenteelt.* Vol. 35. No. 1. pp. 1–19. [No date. ? 1923.]

The author records that he has treated eleven buffaloes, diagnosed as suffering from surra, with "Bayer 205" in Java. Each animal received a single intravenous injection of 3 or 5 grammes (in a 5 per cent. solution); and all were put in dark, fly-free stalls and kept under observation—with daily microscopic examination of the blood—for a month after treatment. The results are summarized in eleven tables occupying six and a half pages, and were briefly as follows: four animals died shortly after receiving the injection, though there was nothing to show that the treatment caused death, whilst the other seven animals made an apparently complete recovery.

An unsatisfactory feature of these cases is that, with a single exception, none of the buffaloes showed trypanosomes in its blood before treatment. As the preliminary blood-examinations were all negative, the diagnosis of surra was therefore made from symptoms only. The blood of all "cured" animals remained negative after treatment, as long as they were under observation; but in view of the negative results before treatment, it is obvious that there is no direct evidence here to prove that the drug can cure an infection with *T. evansi* in the buffalo. The single exception was case V, which showed many trypanosomes in its blood before treatment, but none afterwards.

The author describes and discusses the symptoms regarded as characteristic of surra by previous writers, and shows that his cases—apart from the negative blood-examinations—fall under the clinical definition of the disease. But he acknowledges that his observations are inconclusive, and is fully alive to the fact that the buffalo is a difficult animal to deal with, as it may acquire a chronic infection with *T. evansi*, and apparently recover from surra without treatment.

Two other noteworthy points are recorded. First, the author notes that, in a systematic investigation of the blood of [presumably healthy]

buffaloes in adjoining places he found "innumerable carriers of the parasite" [*i.e.*, animals showing *T. evansi* in their blood—a fact difficult to reconcile with the complete absence of trypanosomes from nearly all the animals treated]. Secondly, he mentions the case of another buffalo—not included in the series—which showed similar symptoms. It showed no trypanosomes in its blood, however, and was first treated with atoxyl and then with "Bayer 205." Next day it died; but inoculation of its blood (taken before death) and cerebrospinal fluid into dogs produced no infections in these animals. [Such an experiment is obviously incapable of straightforward interpretation.]

In conclusion it is stated that three Bengal oxen were also treated with "Bayer 205." Surra was previously diagnosed in all of these by blood examination, but they showed no other symptoms except a high temperature. After a single injection of 5 grammes their blood remained negative for a period of one month. [No other details are recorded.]

Toxic effects referable to the drug were not observed in any of the animals treated.*

FOURNEAU (E.), NAVARRO-MARTIN (A.) & TRÉFOUEL (M. & Mme.). **Les dérivés de l'acide phenylarsinique (arsenic pentavalent) dans le traitement des Trypanosomiases et des Spirilloses éxpérimentales. Relation entre l'action thérapeutique des acides arsiniques aromatiques et leur constitution.** [The Derivatives of Phenylarsenic Acid in the Treatment of Experimental Trypanosomiasis and Spirilloses. The Relationship between the Therapeutic Action of the Aromatic Arsenic Acids and their Constitution.]—*Rev. Gen. Méd. Vét.* 1923. June. Vol. 37. No. 6. pp. 551–617.

A paper of this magnitude which contains multitudes of detailed observations does not lend itself to brief summarization, and must be read in the original by those interested. The author's general conclusions may be given as follows:—

The amine radicle in the para or meta position effects a reduction in toxicity. It also increases the parasiticidal action of the phenylarsenic acid in these positions. "The ortho position is always very bad."

A second amine radicle attached in the para position still further reduces toxicity, but in view of the rapid elimination of the drug by the urine the diamine compound exerts a very fleeting effect.

The addition of a third amine radicle increases toxicity and reduces the therapeutic action.

The inclusion of an hydroxyl radicle produces a more marked effect than the inclusion of an amine radicle. The position of the group is of less importance than in the case of the latter. The para position is not the most favourable, and the ortho position is bad when it is the sole group introduced. It is good, however, when there is a para amine group.

The product which has yielded the best results is 4—amino—2 oxyphenyl arsenic acid.

* Summarized by Mr. Clifford Dobell, F.R.S.

DERVISH (J.) & LAIGRET (J.). **Contribution à l'étude des modes de disparition des Trypanosomes des souris sous l'action de divers médicaments actifs : émétique, 189, 205 Bayer.** [The Manner in which certain Drugs (Emetic, 189 and Bayer 205) cause the Disappearance of Trypanosomes from Infected Mice.]—*Bull. Soc. Path. Exot.* 1923. Dec. 12. Vol. 16. No. 10. pp. 770–781. With 1 text fig.

In this paper the authors record the results obtained in the treatment of mice infected with *T. brucei, T. equiperdum, T. evansi, T. rhodesiense, T. lanfranchii* and *T. pecaudi.* All the strains regularly caused death in 4 to 6 days.

Experiments have been carried out with Bayer 205, emetic, and 189 (sodium oxyaminophenylarsenate).

Bayer 205.—Three samples of this drug have been tested under exactly parallel conditions, and have yielded discordant results.

In the case of two of the samples doses of less than four milligrammes failed to effect sterilization with regularity. The toxic dose of these samples was 13 mg.

The third sample was far more efficacious, since 0·1 mg. was found to effect a permanent cure in all the mice treated. This sample was slightly more toxic than the other two. A dose of 9 or 10 mg. caused death within 27 hours, and 13 mg. in four hours. The chemotherapeutic coefficient of this sample was $\frac{1}{900}$, as compared with $\frac{1}{3}$ (approx.) of the other two.

In unstained preparations of the blood of treated animals trypanosomes show no obvious alteration until some twelve hours after the drug had been administered. At about this time the parasites begin to lose their motility and to decrease in numbers. The average period required for the complete removal of trypanosomes from the circulation was 26 hours, but there has been a variation of some hours with different trypanosomes used.

The authors state that they have found a dose of 3 mg. to be effective as a protection for a period of about a fortnight. [They do not specify with which sample of 205 this result was obtained, but from the context it would appear that these results were obtained with the inferior ones.]

Animals injected with 1 mg. or more of the third sample were refractory up to 50 days. Animals cured of one type of infection with this drug resisted re-infection with the same and other parasites.

Immunity only exceptionally followed doses of less than 1 mg.

Morphological changes resulting from the action of the drugs.—The parasites tend to become rounded, to lose their flagellum and undulating membrane and to assume a leishmaniform shape. At the same time they show evidence of degeneration by the appearance either of granules or vacuoles in their cytoplasm or nucleus.

Multiplication is also affected by the drugs. Sometimes there is simply a reduction in the number of dividing forms, and at other times abnormal dividing forms are encountered. Sometimes the abnormal rounded forms appear to be in a phase which suggests that the power of division has been retained to some extent.

The early appearance of granular degeneration appears to be characteristic of the action of 205. With 189 and emetic only a few such forms are seen and these make their appearance much later.

The appearance of rounded forms soon after injection appears to be a typical result caused by emetic. With this drug practically all

the trypanosomes assume this shape. Rounded forms are also found after treatment with 189, but they are not so numerous.

Vacuolation appears after the granular degeneration, and it is most pronounced after treatment with 205.

Bayer 205 appears to stimulate multiplication for about two hours, but shortly afterwards dividing forms become more and more scanty. The authors have never detected the forms described by German authors in which division has taken place save that the resulting parasites remain attached to each other at the posterior end.

Neither emetic nor 189 appeared to have any influence upon dividing forms.

Some further details regarding the action of Bayer 205 upon *T. gambiense* are added to the paper by MESNIL. Of six guineapigs treated, three received 2 doses of 4 cg. of 205. Two of these recovered and one died of an intercurrent disease. The remaining three were treated with 4 and 5 cg., but at a later stage of infection died, but it appeared that death was actually due to the drug.

Three dogs were also inoculated, two were treated with 50 cg., and both recovered as a result of the single dose. The third dog was kept as a control.

DOYLE (T. M.). **The Occurrence of Blue Bodies as a Developmental Stage of** *Theileria mutans.*— *Jl. Comp. Path. & Therap.* 1924. Mar. Vol. 37. No. 1. pp. 18–27.

In this paper the author discusses the question of the occurrence of "blue-bodies" in the lymphatic glands of animals infected with *Theileria mutans* and allied organisms and supplies reasons for the failure to find these earlier.

The possibility of *mutans* infection being actually infection with *Theileria parva* is considered and the conclusion is arrived at that the evidence is against such an identity. *Theileria parva* appears to be limited to Africa south of the equator, while *Theileria mutans* has a wide distribution. Doyle is of the opinion that Egyptian fever, the theileriosis occurring in the Sudan, and that occurring in the Transcaucasus and along the Mediterranean littoral in general are one and the same, and are due to *Theileria mutans.*

The materials used in the investigation have been derived from Cyprus bulls imported for the Serum Institute in Cairo, serum-making bulls, smears prepared from blood and gland juice received from all parts of Egypt and also from Sudanese cattle.

Practically every Cyprus bull imported is infected with *Theileria mutans,* and the infection in the immense majority of cases is a pure one. It would appear that the recrudescence of the infection in these animals is due to the voyage and the damp hot climate during the summer months. It has been observed that recrudescences are always more frequent during the summer and also that during these months the period of fever is of longer duration.

The author is of the opinion that practically all Egyptian cattle harbour *Theileria mutans,* but in only about 30 per cent. of animals does the simultaneous inoculation against rinderpest, to which the animals are subjected, cause a recrudescence of the Theileria infection.

Blue bodies were found in about 7 per cent. of gland smears from Cyprus animals, but they were never detected in gland smears from infected Egyptian animals.

In Doyle's opinion the form of parasite found in the red corpuscles depends upon the severity of the attack. In chronic cases 90 per cent. of the parasites are ring-shaped, while in very acute cases practically all the parasites are bacillary. True cross-shaped forms have not been found in either acute or chronic cases.

While BRUMPT, DONATIEN and others have found blue bodies in the circulating blood in *mutans* infections, the author has not detected them there, nor has MASON, save on one occasion. For many years MASON also failed to find them in gland smears.

In all cases in which blue bodies were found in gland smears during life a thorough search was made in the internal organs when the animal was bled out for rinderpest virus. The animals were bled out on the third day of the febrile reaction due to the rinderpest inoculation, as it was thought that three days of fever would be sufficient to cause a recrudescence of the Theileria infection, but this proved not to be the case. Blue bodies were only found in a small proportion of cases when high fever had existed for at least five or six days even though there was a very heavy invasion of the blood stream. Blue bodies were found to be present in gland smears for about two days only and to disappear when the temperature fell. The only lesion which can be considered characteristic is the presence of ulcers in the fourth stomach. These vary in size up to 1 cm. in diameter, they have thickened edges, and they vary in colour from red to white according to their age. They are almost invariably confined to the cardiac portion of the stomach.

As an explanation of the failure to detect blue bodies earlier the author suggests that calves are infected while young and that blue bodies may occur during the earliest attack and some of the first relapses. Subsequently such tolerance is established that blue bodies are not formed.

The severity of tick infestation is another factor in determining tolerance. In South Africa, where tick infestation is heavy, blue bodies appear in the glands before parasites make their appearance in the blood. In Northern Africa, where tick infestation is light, the reverse is the case.

VAN LIER (J.). **Over het voorkomen van** *Piroplasma canis* **in Ned. Indië.** [On the Occurrence of *P. canis* in the Dutch East Indies.] —*Nederl.-Indische Bladen v. Diergeneesk. en Dierenteelt.* Vol. **35**. No. **1**. pp. **46–54**. [No date. ? 1923.]

In a previous paper (*Veeartsenijk. Bladen v. Ned.-Indië*, xxxii, Nos. 4 and **5**, and xxxiii, No. 1) the author described a number of cases of acute jaundice in dogs in the East Indies. Although he was unable to find any spirochaetes in these animals, either by direct examination or by inoculation of guineapigs, he inferred—as a result of the clinical and post-mortem findings—that they were cases of canine Weil's disease. But WITKAMP (*Ned.-Ind. Bladen v. Diergeneesk en Dierenteelt*, xxxiv, Nos. **4** and **5**) soon afterwards pointed out that the symptoms and pathological changes described bear a close resemblance to those of piroplasmosis, and suggested that *Piroplasma canis* might have been the real cause of the condition.

In the present paper the author carefully examines this criticism, and compares his own findings with those of WITKAMP and other writers on canine piroplasmosis. As a result he concludes: "The

symptoms and post-mortem findings in my dogs suffering from acute icterus, considered in conjunction with those described by WITKAMP and others in dogs suffering from canine piroplasmosis, together with the fact that in no single dog of mine, alive or dead, was *Piroplasma* found, do not convince me that my dogs with jaundice were cases of piroplasmosis." But the author regards the critique as well founded, and proposes to inquire further into the matter if an opportunity occurs. Incidentally he also notes that he has now seen 19 cases of acute icterus in dogs, and one in a cat : and that he has also observed, in the same animals, an acute disease with similar symptoms (incessant vomiting, great emaciation and anaemia, etc.) but unaccompanied by jaundice.*

HELM. **Beitrag zum Anaplasmen-Problem.** [Anaplasmosis.]—*Zeitsch. f. Infektionskrahkh. parasit. Krankh. u. Hyg. d. Haust.* 1924. Feb. Vol. 25. No. 4. pp. 199–226. With 2 tables, 2 temperature charts, and 1 plate.

The material with which the author has worked was derived from animals imported into Germany from Texas.

Anaplasma-like bodies were found in the blood of a German ox which had been inoculated intravenously 19 days previously with 150 cc. of defibrinated blood from one of the Texas animals. Simultaneously, there was observed a lymphocytosis, but there were no clinical symptoms of infection. There were inoculated at the same time two white mice, two guineapigs and a sheep. No evidence of infection was obtained, and when the experiment was repeated it again failed to yield any positive result.

In an experiment with ticks (*Ixodes ricinus*), it was found that the larvae derived from females engorged on Texas animals were capable of transmitting the infection. The period elapsing between the placing of the larvae on the animal and the appearance of anaplasms in the blood was two months. The anaplasms increased in numbers until about 30 per cent. of the corpuscles were invaded. There was a simultaneous rise of temperature.

Culture experiments showed that multiplication of anaplasma could be obtained in a medium composed of defibrinated blood with the addition of dextrose in the proportion of 0·1 cc. of 50 per cent. dextrose solution to 6 cc. of defibrinated blood. The results of cultivation were variable. In some of the cultures the parasites retained their customary morphology, but in others forms were observed which have not been encountered in the blood of animals, crescent, bean and oval shapes being found. In the absence of sufficient controls the author was unable to furnish proof that these forms were actually related to anaplasma.

In one instance a subculture was obtained from the primary culture. The optimum temperature was found to be ordinary room temperature. At 32° C. the parasites disappeared rapidly. Negative results were always obtained with the blood of uninfected animals. The absence of suitable animals prevented attempts to transmit the disease by means of cultures from being carried out.

The author discusses the views that have been held with regard to the nature of anaplasma, and comes to the conclusion that the various bodies of a somewhat similar appearance which are sometimes found

* Summarized by Mr. Clifford Dobell, F.R.S.

in the corpuscles of healthy animals can be distinguished from true anaplasma either on account of their number, size, staining reactions, shape, position or by culture experiments from true anaplasms.

Whether anaplasms are actually parasites or a reaction product of some invisible cause remains to be shown.

NIESCHULZ (O.). **Bijdrage tot de Morphologie van het Geitencoccid (*Eimeria arloingi*).** [The Morphology of the Coccidium of the Goat.]—*Tijdschr. v. Diergeneesk.* 1924. Jan. 1. Vol. 51. No. 1. pp. 19–25. With 1 plate and 3 text figs.

The merozoites measure 8 to 14 μ in length, and from 1 to 1½ μ in breadth. The nuclei of the merozoites prior to their separation from each other are ring-shaped, with small inner bodies. In the free merozoites the chromatin figure is in the form of a bi-concave cap, the inner bodies have a polar disposition. There is no distinct nuclear membrane.

In the macrogametes the chromatin of the nucleus varies in its form. In a ripe macrogamete the surface is covered with granules which do not stain with haematoxylin and probably represent a reserve food material.

Microgametocytes. In the stage when the nucleus is single these are mainly distinguishable from the macrogametes by the small size of the inner bodies, and by the looser texture of the chromatin. The microgametes are from 5 to 6 microns in length and possess two flagella measuring from 10 to 15 microns. These flagella come off from close behind the anterior end.

LAVIER (G.). **Sur la fonction du corps parabasal de Giardia.** [The Function of the Parabasal Body of Giardia.]—*Ann. Parasit. Humaine et Comparée.* Paris. 1923. Oct. Vol. 1. No. 4. pp. 342–343.

The author is unable to find any evidence that the parabasal body is in any way concerned with the production of glycogen as has been suggested by some investigators.

DESCHIENS (R.). **Action antiparasitaire des sels de bismuth "per os" et à doses massives dans les infestations à Giardia.** [The Antiparasitic Action of Bismuth Salts in Large Doses in Cases of Giardia Infestation.]—*Bull. Soc. Path. Exot.* 1923. Dec. 12. Vol. 16. No. 10. pp. 737–741.

The author has cured cases of Giardia infection in man (8 cases) and in experimentally infected cats with bismuth carbonate. In passing, the author notes that he found it impossible to infect with Giardia cats already infected with *Belascaris cati*, and he thinks that this may perhaps prove to be the explanation of the failure that has been experienced by some authors in their attempts to infect cats with the parasite. The main principles to be followed in the treatment are: (1) The salts used must be pure and amorphous; (2) Large doses must be given. In man, 50 to 60 grammes should be given daily; (3) The treatment must be prolonged (in man)—one to two months.

In treating the human subject and with a view to preventing derangement of the stomach the bismuth carbonate should be taken on an empty stomach in the morning in water.

Parasites may disappear within 15 days, but it is usually necessary to prolong the treatment to 1 or 2 months. It is advisable to interrupt the treatment every ten days in order to " reactivate " the parasites by means of bile extract or calomel. The absorption of bismuth ceases during the reactivation and the young parasites are rendered more susceptible to it.

Since the bismuth salt is expensive and a treatment requires from 1·0 to 1·5 kilogrammes, its application is limited. Barium sulphate, kaolin and talc are not suitable substitutes.

A cure can only be claimed when systematic examinations of the faeces daily remain negative for 8 to 16 days. Details are given of the system of collecting the faeces daily from patients not in hospital.

BEN-HAREL (Shulamite). **Studies of Bird Malaria in Relation to the Mechanism of Relapse.**— *Amer. Jl. Hyg.* 1923. Nov. Vol. 3. No. 6. pp. 652–685. With 3 plates and 9 charts.

This paper is divided into three sections dealing with (1) The course of the infection ; (2) The tissue changes associated with bird malaria ; (3) Relapses occurring naturally and produced artificially. In connection with the course of the infection twenty-three infected birds were examined.

In four birds acute primary infections were found, in sixteen the disease showed an extended irregular course, and in the remaining three the disease ran a mild course of short duration.

In the spleen at the height of infection endothelial cells distended with pigment were seen, capillaries were found occluded by parasitized red corpuscles, mononuclear cells were increased in number, and young parasites were found both free and attached to mononuclear cells.

In the bone marrow in severe cases there is a reduction in the amount of fat, and a preponderance of mononuclear cells. There is dilatation of the capillaries and parasitized red cells and free trophozoites are found. Parasites were less numerous in situations other than the spleen and bone marrow.

Trophozoites, schizonts, and gametocytes were found.

Naturally occurring relapses were encountered in two birds. These occurred 101 days and 41 days after the parasites had last been seen in the blood. All the parasites were schizonts.

Relapse was produced artificially either by radiation with ultra-violet rays or by injection of adrenalin.

CANTLIE (N.). & MOUBARAK (El Sach Yusef). **Preliminary Observations on the Treatment of 1,314 Cases of Malaria by Intravenous Injection of Quinine.**— *Jl. Trop. Med. & Hyg.* 1924. Feb. 15. Vol. 27. No. 4. pp. 37–39.

The intravenous injections were made with a solution of bihydrochloride of quinine. The dose was 1 cc. containing 6 or 9 grains. The solution was injected slowly, so that about 45 seconds was occupied in the actual injection. The injection was repeated daily until the temperature fell. Two doses of quinine bisulphate, each of 10 grains, were also given daily by the mouth. Injections were stopped when the temperature fell and the oral administration was increased to 30 grains per day. After discharge from hospital 10 grains were given daily for a month.

The injection caused some acceleration of the pulse which lasted for about 3 minutes. In one or two cases there was vomiting and dizziness.

HENRY (T. A.) & BROWN (H. C.). **The Influence of the Medium on the Toxicity of Certain Alkaloids towards Protozoa.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1923. Mar. 15 & May 17. Vol. 17. Nos. 1 & 2. pp. 61–71.

The authors' conclusions are as follows :—

"The net results of this work, so far as therapeutical possibilities go, seem to be as follows :—

"1. The toxicity of quinine, emetine and conessine towards the protozoa used in the experiments [Glaucoma—a ciliate similar to Paramoecium] is considerably increased in an alkaline medium, and it is possible that if this condition can be realised *in vivo*, the action of these alkaloids in protozoal diseases may be made more certain and efficient . . . . .

"2. These results confirm SCHAEFFER's observations that quinine dihydrochloride (acid) is less active than quinine monohydrochloride (neutral), and emphasise ACTON's suggestion that for injection quinine base would probably be more efficient and possibly non-irritant, if a means can be devised for injecting it in solution in this form."

FRANCHINI (G.). **Sur des cultures très anciennes de flagellés.** [Old Cultures of Flagellates.]—*Bull. Soc. Path. Exot.* 1924. Jan. 9. Vol. 17. No. 1. pp. 32–35.

The author gives details of the re-examination of some of his old culture tubes. He has been able to detect encysted forms of the flagellates, and has been able to start fresh cultures from these.

CERNAIANU (C.). **Sur une epizootie de Spirochétose des poules. Action préventive et curative du neosalvarsan.** [An Outbreak of Avian Spirochaetosis. The Protective and Curative Properties of Neosalvarsan.]—*Archiva Veterinara.* 1923. Vol. 17. No. 4–5. pp. 80–84.

The author describes the symptoms typical of the disease, and indicates that spirochaetes were present in enormous numbers in the blood of diseased birds at the time of death.

A most careful search failed to reveal the presence of *Argas reflexus*, the usual transmitting tick, but *Dermanyssus avium* was found to be present in immense numbers in the fowl houses. Dermanyssus was found in small numbers only on the birds. *Menopon trigonocephalum* was also present, but not in very large numbers. An experiment in which an attempt was made to transmit the infection by means of Dermanyssus failed.

As atoxyl was not available neosalvarsan was used for treatment. A single intra-muscular injection of ·0375 g. per kilog. was found to be efficient for the cure of birds which had reached even the third or complete paralysis phase of the disease. Parasites had practically disappeared from the blood within three hours of the injection, and none could be found after five hours.

Thirty-one birds in various stages were treated, apparently with success in every case.

Eighteen birds which were showing no symptoms were treated as a precautionary measure. None of these became infected. Sulphur and lime-wash were used for the thorough disinfection of the fowl-houses.

RODHAIN (J.) **Sur la réceptivité des roussettes épaulières,** *Epomophorus Wahlbergi Haldemani* **Hallowell et** *Micropteropus pusillus* **Peters au** *Spirochaeta Duttoni* **Todd.** [The Susceptibility of the Flying Foxes to *Spirochaeta duttoni*.]—*Bull. Soc. Path. Exot.* 1923. Dec. 12. Vol. 16. No. 10. pp. 729–733.

VAN DEN BRANDEN and VAN HOEF have published accounts of their attempts to infect the common flying fox (*Eidelon helvum*) with *Sp. duttoni*. Success was not achieved.

Rodhain has carried out experiments with the species commonly found in the estuary of the Congo, and has succeeded in obtaining positive results.

Inoculations were carried out with a " mash " of ticks (*O. moubata*) from an area in which human spirillosis had been detected. Two flying foxes were used and in both cases the infection proved fatal. Death occurred on the 15th and 17th days.

The lesions were haemorrhages of the pleura and dura mater, anaemic infarcts of the spleen and kidneys. The spleen was enlarged. Smears of the organs showed the spirochaetes in immense numbers.

DISEASES DUE TO METAZOAN PARASITES.

GOSSET. **Présence de sangsues dans le larynx et le pharynx d'un cheval. Laryngotomie.** [The Presence of Leeches in the Larynx and Pharynx of a Horse.]—*Rec. Méd. Vet.* 1923. Dec. 30. Vol. 99. No. 24. pp. 480–481.

The horse, an entire arab, was brought under the observation of the author while in Syria because it had eaten nothing for two days, and because blood came from the nostrils. There was marked depression, the head was extended in line with the neck, and the throat was slightly swollen and painful. Pressure produced a weak cough. There was an abundant discharge of blood stained serum, containing clots of blood ranging in size up to that of one's thumb, from the nostrils. Blood-tinged saliva dribbled from the mouth. There was constant movement of the jaws. Deglutition was difficult. Respiration was slightly hampered. The following day, while the other symptoms remained unaltered, the difficulty of respiration was so pronounced that there appeared to be some risk of asphyxiation. It was decided to perform laryngotomy, with the double object of relieving the respiration and of permitting a detailed examination of the larynx and pharynx. Examination of the mouth revealed the presence of a single leech attached to the hinder part left lateral aspect of the tongue. Nothing could be detected in the nostrils.

The crico-thyroid ligament was divided and the interior of the larynx was found to be streaked with blood, among which were some small clots. A leech was found attached close to the glottis. Further examination revealed no more. A tracheotomy tube was inserted and the animal allowed to rise.

Three days later a fresh examination of the mouth led to the detection of four leeches attached to the base of the tongue at the sides. These were removed and the animal made an uninterrupted recovery.

RODHAIN (J.). **Larve de diptère parasite cuticole de l'Eléphant d'Afrique.** [Larval Diptera parasitic in the Skin of the African Elephant.]—*Bull. Soc. Path. Exot.* 1924. Jan. 9. Vol. 17. No. 1. pp. 86–92. With 1 text fig.

The parasite described in this paper was found in the skin of tame elephants at Api in the Belgian Congo. It is responsible for very very slight lesions only.

They occur on the croup, flanks, thighs and shoulders, and are observed during the dry season—September to February. Larva placed upon soft earth buried themselves, and the flies emerged after about 20 days. Unfortunately, they escaped and were therefore not examined.

The three larvae examined by Rodhain were at the third stage. They measured 7 to 10 mm. in length by 7 in breadth. For a detailed account of the morphological details of the parasite the original paper must be consulted.

GEDOELST (L.). **Les trois stades larvaires de** *Cobboldia loxodontis.* [The Three Larval Phases of *Cobboldia loxodontis.*]—*Ann. Parasit. Humaine et Comparée.* Paris. 1923. Oct. Vol. 1. No. 4. pp. 354–362. With 3 text figs.

The third phase larvae of *Cobboldia loxodontis* of the African elephant have been described by a number of authors, and the second phase larva was described by Gedoelst in 1916. The first stage has not previously been described.

The first phase larvae were found by BRUMPT in the stomach in 1902. These specimens have been sent to Gedoelst by LAROUSSE.

The author describes the first, second, and third phases in detail.

ALLEAUX (V.). **Ascaridiose des voies biliaires chez deux Porcelets.** [Ascarids in the Bile Ducts in Two Small Pigs.]—*Ann. Parasit. Humaine et Comparée.* Paris. 1923. Oct. Vol. 1. No. 4. pp. 352-353. With 1 fig.

The pigs were about six weeks old and showed evidence of abdominal pain. They were in good condition, but the fat and connective tissues were all greenish-yellow in colour. The bile duct was plugged with worms and worms were found in the smaller ducts in the substance of the organ. The intestines had been destroyed before the author saw them, but they were reported to have contained numbers of parasites.

LANE (Clayton). **Some Strongylata.**—*Parasitology.* 1923. Nov. Vol. 15. No. 4. pp. 348–364. With 80 text figs.

The author describes the following parasites: *Libyostrongylus* n. g., *Libyostrongylus hebrenicutus* n. sp. from the stomach and duodenum of a gorilla, *Agriostomum vryburgi* Railliet, 1902 (an amplified description from parasites obtained from *Bos indicus*), *Raillietostrongylus*

samoensis (Lane, 1922) from the small intestine of the domestic pig in Samoa, *Globocephalus connorfilii* Lane, 1922, small intestine of the domestic pig, Samoa, *Necator congolensis* Gedoelst, 1916 (an amplified description based upon the examination of specimens from the stomach, small intestine, ileo-caecal valve and colon of the gorilla. *Oesophagostomum radiatum* is recorded in the large intestine of the water buffalo, *Nippostrongylus muris* (Yokogawa, 1920). The examination of Trichostrongyloidea from the small in testine of the rat in Samoa permits of enlargement of the description of *Heligmosomum muris*. The symmetrical bursa and the bell-shaped ending of the female appear to require the allocation of this species to a genus other than Heligmosomum, for which the name Nippostrongylus is proposed, with *Nippostrongylus muris* as its type.

SMIT (H. J.) & NOTOSOEDIRO (R.). **Eenige Strongyliden onzer Huisdieren.** [Some Strongyles of our Domesticated Animals.]—*Nederl.-Indische Bladen v. Diergeneesk. en Dierenteelt.* Vol. 35. Nos. 2–3. pp. 191–198. With 4 figs. [No date.]

The worms described and figured in this paper are *Oesophagostomum dentatum, Oesophagostomum asperum, Oesophagostomum* (*Proteracrum*) *radiatum, Agriostomum vrijburgi.*

GOODEY (T.). *Necator americanus* **and the Domestic Pig.**—*Jl. Helminthology.* 1923. Sept. Vol. 1. No. 4. pp. 161–164.

The author has tried to infect two pigs both *via* the skin and by feeding with *Necator americanus*, but entirely without success.

TREFFERS (W.). **De leverbotziekte en hare bestrijding middels Distol.** [Distomatosis and its Treatment by Means of Distol.]—*Nederl.-Indische Bladen v. Diergeneesk. en Dierenteelt.* Vol. 35. No. 1. pp. 41–45. [No date.]

In central Java Treffers found 301 out of 1,874 bovines infected with Distoma (species not stated) within a period of 6 months. In 4 cases he tried the medicament " distol " in doses of 12–18 grams taken at once, or spread over 4 days. In 3 cases the ova disappeared from the faeces and there was a marked improvement in general health. The preparation should only be used in animals when the nutrition is impaired, the growth retarded, and faeces are fluid, and when ova are found. Here the application of the medicament is soon followed by improvement in condition, the faeces acquire a normal consistency, but the ova in some cases do not disappear till after 2–3 weeks. Treffers afterwards treated some more cases, which are not described in detail.*

ANDERSON (C.) & GOBERT (E.). **Note relative à la prophylaxie de la bilharziose en Tunisie.** [Prophylaxis against Bilharzia in Tunis.]—*Bull. Soc. Path. Exot.* 1924. Jan. 9. Vol. 17. No. 1. pp. 35–37.

BITTNER (H.) *Schistogonimus rarus* **(Braun), ein seltener Trematode in der Bursa Fabricii einer an Tetrameres-Invasion gestorbenen Hausente.** [*Schistogonimus rarus* an Uncommon Trematode of the Duck.]—*Arch. f. Wissen. u. Prakt. Tierheilk.* 1923. Vol. 50. No. 3. pp. 253–261. With 1 text fig.

* Summarized by Dr. N. H. Swellengrebel.

CAMERON (T. W. M.). **On the Morphology of *Ollulanus tricuspis* Leuckart, 1865, a Nematode Parasite of the Cat.**—*Jl. Helminthology.* 1923. Sept. Vol. 1. No. 4. pp. 157–160. With 6 figs.

CAWSTON (F. G.). **Bifid-Tailed Cercariae in Burnupia.**—*Jl. Trop. Med. & Hyg.* 1923. Dec. 15. Vol. 26. No. 24. pp. 363–364.

CHALON (G.). **Présence d' *Ornithodoros savignyi* (Audouin) à Ouargla (Sahara algérien).** [The Presence of *Ornithodorus savignyi* (Auduoin) at Ouargla in the Algerian Sahara.]—*Bull. Soc. Path. Exot.* 1923. Dec. 12. Vol. 16. No. 10. pp. 741–742.

CHANDLER (A. C.). **Observations on the Life Cycle of *Davainea proglottina* in the United States.**—*Trans. Amer. Micros. Soc.* 1923. July. Vol. 42. No. 3. pp. 144–147. With 2 text figs.

CONREUS (A. Charles). **Cachexia ossea dos equidos. Cylicostomose, Cachexia verminosa dos equideos.** [Osseous Cachexia of Equines. Cylicostomiasis.]—1° *Cong. Nac. Med. Vet. Brasil.* 1922. Sept. Rio de Janeiro. pp. 75–119.

SCHUURMANS STEKHOVEN (J. H.). **De Bloedzuigende Arthropoda van Nederlandsch-Oost-Indië.** [The Blood-sucking Arthropods of the Dutch East Indies.]—*Nederl. Indische Bladen v. Diergeneesk. en Dierenteelt.* [no date.] Vol. 35. Nos. 2–3. pp. 103–144. With 4 text figs.

SCHUURMANS STEKHOVEN (J. H.). **De Bloedzuigende Arthropoda van Nederlandsch-Oost-Indië. VI. De teeken van de Kleine Soenda-eilanden.** [The Bloodsucking Arthropods of the Dutch East Indies. VI. The Ticks of the Small Islands of the Sound.]—*Nederl. Indische Bladen v. Diergeneesk. en Dierenteelt.* [no date.] Vol. 35. Nos. 2–3. pp. 145–148.

SMIT (H. J.). **Nog eenige Strongyliden van het Paard op Java. IV.** [The Strongyles of the Horse in Java.]—*Nederl. Indische Bladen v. Diergeneesk. en Dierenteelt.* [no date.] Vol. 35. No. 1. pp. 29–36. With 5 figs.

SMIT (H. J.). *Paramphistomum explanatum.*—*Nederl. Indische Bladen v. Diergeneesk. en Dierenteelt.* [no date.] Vol. 35. Nos. 2–3. pp. 185–190. With 2 figs.

BACTERIAL DISEASES.

PFENNINGER (W.). **Zur Diagnose der Bazillenausscheider in der Milch beim durch Bac. Bang verursachten infektiösen Verwerfen des Rindes.** [The Detection of Abortion Bacilli in the Milk of Animals affected with Contagious Abortion.].—*Schweiz. Arch. f. Tierheilk.* 1923. Dec. Vol. 55. No. 12. pp. 600–609.

The author describes the results obtained with milk from 26 cows. Guineapigs were inoculated with sediment from 50 cc. of milk obtained by centrifuging for 10 minutes at 2,000.

The serum of the guineapigs was tested by agglutination for the first time four weeks after inoculation, and for the second time two to four weeks later.

Eight positive results were obtained out of the 26 samples tested, but the author states that three samples were obtained from recently purchased animals which had come from uninfected herds, so that in reality the figures read as eight positive results out of 23, or 34·8 per cent.

Five of the cows had aborted and three had not.

In two cases the guineapigs inoculated were pregnant, and the bacillus was detected microscopically and by culture in material from the stomachs of the foetuses.

HOLMAN (W. L.) & FERNISH (C. A.). **Studies on *Bacillus anthracis* from the Faeces of Guinea-pigs fed with Anthrax Material.**—*Amer. Jl. Hyg.* 1923. Nov. Vol. 3. No. 6. pp. 640–648.

The object of the authors in carrying out these experiments was to elucidate the problem as to the occurrence or otherwise of anthrax contracted by way of the alimentary canal. The possibility of anthrax being contracted by this path has been denied by BESREDKA. Guinea-pigs were used in the experiments, and to avoid accidental infections by other paths sporulating culture material was placed in gelatin capsules and these were placed well back in the animals' throats.

In all, twenty-one guineapigs were used, and a systematic study of the faeces was carried out in nineteen of these. Only one animal died of anthrax, the remaining eighteen survived. The faeces were examined by plating, and colonies obtained were subsequently identified by inoculation into other guineapigs. In the course of the experiments a sporulating aerobe was detected in the faeces which formed colonies remarkably like those of anthrax.

In the course of the experiment observations were made regarding the possibility of non-sporulating anthrax bacilli forming spores in the alimentary tract. Blood from an animal just dead and spleen pulp from a similar source were fed to guineapigs in capsules. The absence of spores in the material was established by the fact that cultures could not be obtained from the blood when it had been heated to 70–80° C. for 20 minutes. Spores were found in the faeces of the guineapig fed with spleen pulp. The authors have shown that if laboratory animals are inoculated at a place where there is a small amount of connective tissue such as the ear there is no visible local reaction in the form of an oedema.

BROCQ-ROUSSEU & URBAIN. **Cuti-vaccination et cuti-immunité anti-charbonneuse chez le cheval.** [Cuti-Vaccination and Cuti-Immunity against Anthrax in the Horse.]—*Rec. Méd. Vét.* 1923. Dec. 30. Vol. 99. No. 24. pp. 482–487.

In this short paper the authors' reproduce the two experiments previously recorded [see this *Bulletin*, 1924, Feb., Vol. 12, no. 1, pp. 27 & 28] and add a third one.

The object of this experiment was the reduction of the interval between the doses of vaccine. The horse was first given 2 cc. of first vaccine. This was injected into the skin of the right side of the neck at 20 different places. Slight oedema appeared at each seat of inoculation and persisted for two days. On the third day after the first inoculation 0·25 cc. of second vaccine was given intradermally and in two injections. A transitory oedema again appeared. Thirteen days after the dose of second vaccine 1 cc. of a very virulent culture of the bacillus was injected intradermally. The result was the development of an oedematous swelling measuring 25 by 20 centimetres with some swollen lymphatics round it. The swelling had quite disappeared by the fifth day. The temperature remained normal throughout. No antibodies could be detected in the animal's serum.

The experiment indicates that a skin immunity was obtained by skin vaccination.

ZELLER (H.). **Ueber den gegenwärtigen Stand der Schutzimpfung gegen Rauschbrand mit keimfreien Filtraten.** [The Present Position regarding the Use of Germ-free Filtrates for Black-Quarter Vaccination.]—*Berlin. Tierärzt. Wochenschr.* 1924. Jan. 31. Vol. 40. No. 5. pp. 49–51.

The author summarizes briefly the results which have been obtained with filtered cultures and the "natural aggressin," that is, filtered peritoneal fluid obtained from experimentally infected animals.

GRÄUB (E.). **Weitere Mitteilungen über die Schutzimpfungen gegen den Rauschbrand mit dem keimfreien Filtrat Gräub-Zschokke.** [Further Results obtained by Vaccinating against Black-Quarter with a Germ-Free Vaccine.]—*Schweiz. Arch. f. Tierheilk.* 1924. Jan. 31. Vol. 66. No. 2. pp. 33–35.

The author gives the figures for the inoculations carried out in Switzerland in 1922 and 1923. The total number of animals vaccinated was approximately 70,000 and 90,000 in the two years. No cases of black-quarter followed the vaccinations but the immunity was broken down in 71 cases in 1922 and in 87 in 1923, *i.e.*, about 1 per 1,000 in each year.

The distribution of the cases of black-quarter appears to have been irregular and not in proportion to the number vaccinated. It is further noted that approximately 60 per cent. of the cases occurred in Bern in both years.

An increase of the dose of filtrate used from 2 cc. up to 3–5 cc. did not affect the number of cases developing subsequently. It appears to be probably that some of the deaths were not due to infection with the bacillus of black-quarter, but to infection with the vibrion septique (in 32 per cent. of cases).

TRUCHE (C.). **De la typhose aviaire.** [Fowl Typhoid.]—*Ann. Inst. Pasteur.* 1923. May. Vol. 37. No. 5. pp. 478–497.

The author states that at the present time three diseases are causing serious losses among poultry in France. These are fowl cholera, fowl typhoid, and fowl diphtheria. These diseases have special geographical distributions. Fowl cholera occurs in the north and eastern areas and is believed to have been imported from Germany, fowl diphtheria in an area having a radius of 100 kilometres round Paris, and fowl typhoid, which is described as a new disease, in the region between the Loire and the Pyrenees. This is not to say that the diseases do not occur outside their various areas, but that the areas indicated are those generally involved.

Fowl typhoid is said to have been practically unknown in France prior to the war, although it was widespread in Europe, apart from France, and in the United States.

There are two distinct diseases classed as fowl typhoid ; they are caused by closely allied organisms, but are clinically distinguishable. These are white scour, caused by *Bact. pullorum*, and true typhoid, caused by the *Bact. sanguinarium* or *Bact. gallinarum alcalifaciens*. White scour occurs in birds ranging in age up to two months. The faeces are very fluid and are passed frequently. Their colour changes

from yellow to greenish and finally to white. There is general evidence of depression and progressive weakness. The course of the disease varies somewhat, but as a rule it terminates fatally in two or three days. Lesions are as a rule inconspicuous, save that there is almost invariably marked enlargement of the liver. This organ may weigh five or six times the normal weight. The other lesions are intestinal congestion with haemorrhagic plaques, slight enlargement of the spleen, and the typical intestinal contents.

The disease is transmitted to the eggs, and fowls which recover harbour the organism in the ovary and oviduct. Although the disease is mainly seen in young birds, adults do not escape entirely.

The true typhoid infection occurs in adult birds. Those affected lose their appetite, and have a dull and sleepy appearance. Diarrhoea is observed in some cases, but it is not an invariable symptom. The temperature is raised, the features ruffled, the wings drooping, and the gait uncertain. The disease usually runs its course in about a week or ten days, but it may last for three weeks. The mortality is variable. Some authors describe a marked leucocytosis accompanied by a reduction in the number of red corpuscles. The lesions are not conspicuous. When the disease runs a rapid course there is only a slight degree of wasting. The liver is a little enlarged, soft and friable, and of a pale yellow colour. There is sometimes enlargement of the spleen, but it is never haemorrhagic. There may be some congestion in the portal area. Only adult birds are attacked, and infection takes place by ingestion. It is not always possible to set up the disease by the ingestion of cultures. The organism may be very scantily present in the blood, and subcutaneous inoculation with this may fail to cause infection.. Cultures vary in toxicity. They may cause the death of mice within 36 hours, but in some cases the inoculation does not cause death.

Inoculation with spleen pulp is almost invariably fatal, but the period of incubation is usually rather long, and may be as much as five days.

Special attention is drawn to the occurrence of the organism in the central nervous system and bone marrow, from which it may be obtained in a state of purity several days after death. The disease is most commonly seen in the fowl, but may occur in the duck, goose, turkey, and pigeon. In the last of these it is agreed by a number of investigators that it is difficult to produce infection. Rabbits and mice are susceptible to varying degrees, but guineapigs are resistant to subcutaneous inoculation. A fatal result is obtained with certainty when large doses are injected intraperitoneally.

The disease occurs at all seasons, but appears to be particularly severe during the summer.

Poultry shows are credited with causing the dissemination of the disease. Both the *Bac. pullorum* and *B. gallinarum* grow rapidly in broth. They produce turbidity and a deposit. There is never a complete surface growth, but there may be a ring of growth round the margin of the surface of the broth. The cultures produce an odour resembling that of Bacillus para. B. There is no production of indol in peptone waters.

On agar, opaque white hemispherical colonies measuring 2–3 mm. develop. After several days the colonies become brown in the centre.

B. gallinarum is a short rod-shaped organism measuring 1 to 2·5 μ in length by 0·3 to 0·5 μ in thickness. The ends are slightly rounded.

In Martin's broth it is often shuttle-shaped. On agar there is no formation of chains. It is non-motile and gram negative. In cultures in liquid media the organisms stain in a bipolar manner. It is both aerobic and anaerobic. It is readily killed at 55° C. (20 minutes).

Morphologically and culturally *B. gallinarum* and *B. pullorum* are identical, but while mannite, arabinose, laevulose, and glucose are fermented by both, there is an evolution of gas in the case of *B. pullorum*. This is the most important differential feature.

B. pullorum, *B. sanguinarium*, Eberth's bacillus and paratyphoid A are reciprocally agglutinated with the corresponding sera.

The filtered cultures of both organisms are toxic, but the toxicity varies in different strains. The fatal dose for a rabbit by intravenous injection ranges from 1 to 3·5 cc.

The question of transmissibility to man has not yet been solved, but in certain instances intoxications of alimentary origin have been thought to have been due to the ingestion of raw eggs infected with *B. pullorum*.

No medicinal treatment of any real value has been discovered, and various vaccines and sera have been tried with varying success. A point which militates against the use of vaccines is the apparent necessity that the vaccine should be autogenous.

Bridré (J.) & Donatien (A.). **Le microbe de l'agalaxie contagieuse et sa culture in vitro.** [The Organism of Contagious Agalaxia and its Cultivation in Vitro.]—*Rec. Méd. Vét.* 1923. Nov. 30. Vol. 99. No. 22. pp. 441–444.

The authors claim to have been able to cultivate the causal organism of contagious agalaxia of the sheep. A number of earlier investigators have been unable to produce the disease with bacteria cultivated from diseased animals.

The seed material was derived from the liquid from a joint showing specific lesions. This was diluted to about 3 per cent. in citrated salt solution. The medium used was mutton broth 2 to 4 parts, and horse serum 1 part. Cultures were incubated at 37° C., and after 8 days evidence of growth was obtained. Microscopic examination failed to reveal any recognisable bacteria, but subcultures were carried on in series and growth was found to be more rapid as the series progressed. After 20 generations growth was visible in 36 hours.

The organism grows either under aerobic or anaerobic conditions. If only a drop or two of seed material is used and the broth is not disturbed growth takes place as a faint ring-shaped cloud at the place where the seed material has been introduced. This increases in size, but there is no tendency to sedimentation. In tubes in which the broth is covered with paraffin the cloud forms immediately below the layer of oil and gradually extends until the whole of the medium is turbid. Veal or beef may be used to replace mutton in preparing the broth without affecting the results. Positive cultures have been obtained with a drop or two of virulent milk diluted to 1 in 200.

Surface cultures may be obtained on solid serum or serum agar. The colonies are small, irregular in outline, and are surrounded by an iridescent rim.

The proof of the causal connection of the organism with the disease rests upon (1) The production of specific arthritis in a sheep with 0·5 cc. of a seventh subculture, it being argued that it cannot be

persistence of original material since a dilution of original virus to a corresponding extent (calculated 3×10^{14}) is incapable of producing the disease; (2) A goat inoculated with a culture of the seventh generation developed mammitis on the eighth day, and milk from this animal injected into a joint of a sheep produced arthritis, and, after a few days, keratitis; (3) The virus has been maintained by passages in vivo and in vitro, and the twentieth generation caused specific arthritis and keratitis in a sheep.

It is noted that all the cultures used for inoculations were made under paraffin.

A preparation from the tenth generation was stained by the slow Giemsa method after May-Grünwald fixation, and in this the organism was found to be present in various forms ranging from a slender bacillus 2 to 5 μ in length, more or less curved and resembling vibrios, to long spirochaete-like forms.

This appearance has been preserved in successive cultures. As cultures become old, deeply-stained granules appear at one end of the organism. With the ultra-microscope some individuals appear as a chain of cocci. With the same instrument it can be seen that the organism is motile, and it is said that the type of motility resembles that of the mosquito larva in water.

The authors draw attention to the resemblance in both cultural character and morphology between this organism and that of contagious peripneumonia—the first filterable virus to be cultivated.

DISEASES DUE TO FILTERABLE VIRUSES.

RABAGLIATI (D. S.). **Experiments on the Immunity conferred on Calves by Inoculation against Cattle Plague.**—*Jl. Comp. Path. & Therap.* 1924. Mar. Vol. 37. No. 1. pp. 1–18. With 3 charts.

The author publishes in this paper certain results which it was intended should be published by a committee at whose instigation the experiments were carried out, but which was dissolved before that could be done.

The object of the experiments was to obtain information regarding the immunity possessed by calves born of animals immunized by the simultaneous method during pregnancy. Certain other points also came up for consideration in connexion with immunity of calves. In the first set of experiments it was found that calves born of cows doubly inoculated during pregnancy may behave in one of three ways when tested by inoculation with virulent blood. Some of the calves were tested one month after birth and while still sucking, and some were also tested at five months, that is to say, one month after weaning. They may react to an inoculation with virulent blood both before and after weaning. More frequently they do not react to inoculation while sucking, but may react after weaning. They may fail to react to both test inoculations. The calves which received virulent blood after weaning, whether they reacted or not, were proved to be immune up to 1 year and 10 months. It is noted that the experiment shows

that the double inoculation failed to cause any disturbance of health in the pregnant cows, although some of these were in an advanced stage of pregnancy.

Circumstances prevented the carrying out of any tests on calves born of animals which were subjected to double inoculation, but which failed to show any evidence of reaction when the inoculation was carried out. The results obtained with calves the progeny of animals immunized before service were generally similar to those obtained with calves the progeny of animals immunized during pregnancy.

In this set of experiments it was established that calves of cows which were doubly inoculated prior to service may or may not react to a double inoculation at ages of 6 months or more, irrespective of whether the dams showed any reaction to the immunization or not. Experiments were carried out with a view to determining at what age calves can be immunized by double inoculation so as to yield a lasting immunity, and the results indicated that calves of 1 year can be treated in the same manner as adult cattle.

The experiments supply confirmation of the fact that a reaction to the double inoculation is not essential for the production of immunity. The conclusion is drawn from the experiments that though the double inoculation of calves may not establish a lasting immunity, it is preferable that such inoculations should be carried out.

DE SOUZA (Moacyr Alves). **Algumas experiencias com a peste bovina em S. Paulo em 1921.** [Some Experiments in connection with Rinderpest in S. Paulo in 1921.]—1° *Cong. Nac. Med. Vet. Brasil.* 1922. Sept. Rio de Janeiro. pp. 72–74.

The period of incubation was 2 to 4 days, and the duration 5 to 7.

A specimen of *Margaropus bovis* which had engorged itself upon an animal infected with rinderpest maintained the virus at full virulence for 7 days. Emulsions of infected ticks which were kept at room temperature and protected from light failed to transmit the disease after 16 days.

The eggs derived from infected ticks were found to be avirulent.

BARROS (Paulo de Moraes). **A peste bovina. Notas, com referencia particularmente ás observações nas Ilhas Philippinas.** [Rinderpest.]—1° *Cong. Nac. Med. Vet. Brasil.* 1922. Sept. Rio de Janeiro. pp. 56–63. With 1 map.

This paper contains an account of an outbreak in Sao Paulo.

FROSCH (P.). **Zur Morphologie des Lungenseucheerregers. II. Mitteilung.** [The Morphology of the Causal Organism of Pleuro-Pneumonia.]—*Arch. f. Wissensch. u. Prakt. Tierheilk.* 1923. May 10. Vol. 49. No. 6. pp. 273–282. With 11 figures.

In this paper the author describes the appearances presented by the organism in a number of different culture media and gives photographs of these. In all cases the microphotographs were taken without any fixing or staining of the specimens.

DAHMEN (H.). **Beitrag zum Studium der Lungenseuche des Rindviehs. II. Mitteilung.** [Contribution to the Study of Pleuropneumonia of Cattle.]—*Arch. f. Wissensch. u. Prakt. Tierheilk.* 1923. May 10. Vol. 49. No. 6. pp. 283–288.

The author describes an improved method of preparation of cultures for antigenic purposes. With a view to getting a layer of agar throughout the length of his tubes he heats the glass, and by pressure produces a ridge across the tube projecting into the lumen. This acts as a barrier when the tubes with the agar in them are laid flat on the table, and enables him to get a layer of agar of constant thickness. The surface of the agar after setting is covered with sterile serum. Water of condensation is avoided by incubating the tubes for a couple of days after they have been prepared.

Colonies appear in 3 to 5 days after the tubes are inoculated. With tubes prepared in this way the author has succeeded in obtaining primary cultures from diseased lungs with ease, colonies becoming visible within 3 to 4 days.

In obtaining primary cultures Dahmen advises that the original material should be enriched by incubation for two or three days before it is used for the inoculation of the agar tubes. In investigating the cultural characters the author has found that the organism produces acid but no gas in media containing sugar.

Evidence was obtained that the growth tends to sink to the bottom of liquid media, and further, that the organism is non-motile.

In observation with fermentation tubes which have not been inoculated, Dahmen has obtained evidence that serum added to broth "absorbs acid." Cultural experiments with fermentation tubes have shown that the organism is an obligatory aerobe. Acidity is necessary for the growth of the organism.

For agglutination tests the author uses a mixture in equal parts of a serum-grape-sugar-broth culture and salt solution. The degree of turbidity of this mixture is sufficient to make it possible to obtain recognisable clearing with positive sera. The tubes were incubated for 3 hours and were then centrifuged for 10 minutes. The deposit is then examined. When the tubes were agitated flocculi were detected in those containing positive and negative sera, but they were distinctly larger in the case of the tubes containing positive sera. The author thinks that the reaction obtained with liquid cultures in agglutination experiments is in reality in the nature of a precipitin reaction.

GIESE (C.) & WEDEMANN (W.). **Zur Feststellung der Lungenseuche beim lebenden Rinde.** [The Detection of Pleuropneumonia in the Living Ox.]—*Zeitsch. f. Infektionskr. parasit. Krankh. u. Hyg. d. Haust.* 1924. Feb. Vol. 25. No. 4. pp. 176–189.

For preparing antigen for use in the complement fixation test the authors use the following medium. Beef broth is prepared (apparently without peptone or salt) and its reaction is corrected to pH8 (Michaelis). It is then heated to 100° and filtered through paper. When it has cooled down to about 40°, 8 per cent. horse serum and 0·5 per cent. glucose are added. The broth is then filtered through a Berkefeld filter. It is placed in Erlenmeyer flasks. These are inoculated with seed material and incubated for at least 6 to 8 weeks. The

resulting material is the antigen and it may be kept by sealing up suitable quantities (5 cc.) in small tubes.

The authors have carried out tests with materials from some hundreds of herds in which the presence of the disease was suspected, and from an almost equal number of herds in which there was no such suspicion. Details are given of ten of these. The results of the tests are given and are compared with the results of post-mortem examinations. These indicated that the method is practicable for the detection of the disease.

IMAMURA (Arao). **Über die Kultur des Lyssavirus in Vitro.** [The Artificial Cultivation of the Virus of Rabies.]—*Mitt. a.d. Med. Fak. d. Kaiserl. Univ. Tokyo.* 1922. Sept. 25. Vol. 29. No. 2. pp. 347–375.

The author has used pieces of fresh sterile central-nervous tissue in either horse serum or citrated rabbit plasma for the purpose of cultivating the virus of rabies. His seed material has in the present experiments been of the "fixed virus" type, but he indicates the necessity of experimenting with the virus of street rabies. Fragments of nervous tissue containing fixed virus, emulsions and filtrates have all been used for seed material, but success has been achieved with fragments only. Although the author was able to show that the virus was present in the fresh pieces of nerve tissue in the culture tubes he did not at any time discover the virus by microscopic examination. The virus was proved to be present in the nerve tissue after 4 to 8 days incubation at 37° C. It was found that ·0001 g. of this was sufficient to infect a rabbit by subdural inoculation. The cultivation was carried on for four generations successfully, but owing to unavoidable circumstances the experiments had to be brought to a close without being carried further.

IMAMURA (Arao) & SATOH (Shinchoku). **Über die Virulenz des Virus fixe der Lyssa für das Kaninchen und die Veränderung desselben durch verschiedene Einflüsse.** [The Virulence of the Fixed Virus of Rabies for the Rabbit, and its Alteration by Various Means.]—*Mitt. a.d. Med. Fakult. d. Kaiserl. Univ. Tokyo.* 1922. Sept. 25. Vol. 29. No. 2. pp. 307–319.

The authors' experiments led them to conclude that the average fatal dose of brain substance was ·002 mg., and that undried spinal cord was fatal in the same dose.

When the glycerin used for preserving brains had ·5 per cent. of carbolic acid added to it the virulence was well preserved.

An emulsion rapidly lost virulence at room temperature during the summer, or when it was kept in an incubator at 29° C. Dried cords similarly lost virulence when kept at similar temperatures.

AYNAUD (M.) **La Stomatite pustuleuse contagieuse des ovins (Chancre du Mouton).** [Contagious Pustular Stomatitis of the Sheep. (Chancre of the Sheep).]—*Ann. Inst. Pasteur.* 1923. May. Vol. 37. No. 5. pp. 498–527. With 2 figs. & 1 plate.

The disease occurs as an epidemic and its spread through a flock is extremely rapid. Young animals, especially those that are being

fattened for the butcher, are the most frequently affected. The disease has a very wide distribution, and it occurs more frequently in France since the war than formerly.

Sometimes the lesions remain confined to the lips, where dark coloured crusts are formed. Sometimes there is oedema of the lips. The first phase of the lesions is represented by erosions of variable size, which are easily caused to bleed. Neither a vesicular nor pustular stage is observed. The crusts result from the abundant serous exudate from the eroded surfaces. Sometimes they develop on the eyelids, and they may in fact be observed on any part that is devoid of wool as a result of direct inoculation. On a single animal lesions in various stages of development may be seen. When the lesions remain confined to the lips the affected animals are not inconvenienced, and continue to feed, but when the interior of the mouth is invaded the disease has serious consequences. Salivation is pronounced and the affected animals are unable to feed. The disease runs its course in about 12 days. At the post-mortem examination the author has always found a secondary pneumonia due to a pasteurella. He has never found the specific lesions in the respiratory tract. Death is, in fact, due to the secondary invaders, and the mortality depends to some extent upon their virulence. The mortality may be up to 20 per cent. or even higher. The disease is easily reproduced by inoculation, and the best site is on the inner aspect of the thigh, where light scarifications may be made. Evidence of infection is first seen on the third day when the scarifications are reddened. By the sixth day vesicles form along the scarifications. These contain a clear watery liquid. Subsequently, the exudate increases in amount and becomes purulent. The covering of the pustule then becomes detached and the typical crusts form. Though the neighbouring glands may become enlarged, there is no systematic disturbance. The crusts become detached about the twentieth day, exposing cicatrized epidermis. Inoculation on the mucous membrane of the mouth by scarification usually fails because the virus is washed away by the saliva, but if the virus is introduced into the epithelium by puncture with needles success is sometimes achieved. Crusts do not form on lesions of the mucous membrane for obvious reasons.

Histological examination shows that the lesions begin in the thickness of the epithelial layer.

The disease is not transmissible experimentally save by endermic inoculation, and animals of all ages can be infected by experiment. Goats are as susceptible as sheep, and passage through the goat does not prevent the virus from being retransferred to the sheep. The author has succeeded in infecting calves either with lymph direct from a sheep or after passage through a goat.

Rabbits, guineapigs, rats, mice, pigs, donkeys, foals, and birds all appear to be immune.

The crust and lymph are both virulent and it has been found possible to produce infection with dilutions of 1 in 10,000, or even 1 in 100,000. The bulk of the virus is closely associated with the cellular elements. It retains its virulence for a month and perhaps longer in glycerin, but the maximum has not been ascertained, since it is more convenient to keep it in the dry state. Dry crusts maintain their virulence for a year.

Positive results have been obtained with fresh lymph after filtration through earthenware filters. Centrifugation does not appear to

cause the virus to become sedimented. It is difficult to explain this, but it simplifies the preparation of a vaccine free from contaminations. The virus is killed in 30 minutes by a temperature of 56° C. Dry virus is rather more resistant than lymph. Immunity is acquired about three weeks after infection. It has been found that immunity can be conferred by intravenous inoculation, but not by ingestion. The author has not been able to detect any antibodies in the serum. The question is raised as to whether chancre of the sheep and vaccinia are in reality identical. The author, mainly upon the grounds of animal experimentation, comes to the conclusion that they are separate entities. The experiments included cross immunity tests.

For protective inoculation the author has used dried scabs from experimentally infected animals. Powdered scabs are mixed with 50 per cent. glycerin in the proportion of 1 part to 100.

Vaccination is practised on the inner aspect of the thigh, the only instruments necessary are a Chambon lancet and swabs on stiff wire handles. Fifty cubic centimetres of vaccine is sufficient for 200 animals.

It is admitted that it is possible for a vaccinated animal to infect a healthy one and set up the disease, but in practice this risk is found to be negligible. Vaccination does not prevent the evolution of the disease in animals already actually infected. Vaccination is advised even in infected flocks with a view to shortening the duration of the disease in the herd.

MISCELLANEOUS.

Moussu (R.) & Marchand (L.). **L'encéphalite enzootique du cheval.** [Enzootic Encephalitis in the Horse.]—*Rec. Méd. Vét.* 1924. Jan. 15. Vol. 100. No. 1. pp. 1–44.

Enzootic encephalitis, or Borna disease, does not appear to have been known in France prior to the war, but it would appear that it is not a rarity now and that in all probability it was introduced through the medium of American horses. A number of European investigators have isolated organisms, usually diplococci or streptococci, from the central nervous system of infected horses, but in no case have these organisms been found capable of setting up the disease by inoculation.

Kraus, Kantor and Quiroga, working in the Argentine, have, however, isolated an organism which they have found capable of setting up a bacteriaemia in horses, rabbits, guineapigs, sheep, goats and calves, and has proved fatal in 24 hours. But it is to be noted that while in horses inoculated intracranially the organism can be isolated from the brain and from the blood, in animals inoculated intravenously it can be recovered from the blood and not from the nervous system. It is further noted that the lesions produced experimentally in the nervous system differ markedly from those occurring in a natural case. Kraus, Kantor and Quiroga have been able to produce similar results with organisms other than the diplococcus which they incriminate as the cause of Borna disease. It therefore seems clear that the etiology of the disease has not been cleared up. Our accurate knowledge of the histology of the lesions of

Borna disease is due to the work of JOEST and DEGEN. These authors have shown that the disease is an acute encephalitis characterized by perivascular infiltrations in the brain and spinal cord, with cellular inclusions in the hippocampus and olfactory bulb.

The outbreak of the disease, which formed the starting point of the authors' observations occurred in a thoroughbred stud comprising some 80 animals. Fifteen cases occurred within 2 months, and of these six proved fatal.

The disease manifested itself in three forms: (1) As an encephalitis; (2) As a myelitis; and (3) As a combination of these.

Encephalitic form.—The authors have not observed the gastro-intestinal disturbances nor the catarrh of the respiratory passages described by other investigators. The disease has been sudden in its onset and characterized by dullness and depression. Within a few hours a condition of intense excitement has supervened. The periods of excitement last only for a few minutes at first and are followed by periods of depression. The attacks, however, become more prolonged and more frequent until the animal falls to the ground struggling. The authors' attention has been specially attracted by tonic spasms of the flexors of the head and neck during the attacks. There is no loss of sensation, but it is dulled. There is no motor paralysis, but in some cases there is difficulty in swallowing. While there is no alteration in the respiratory rhythm, the respiratory movements are almost invariably irregular.

The authors have encountered cases which they describe as being of the myelitic type, that is to say, without there being any symptoms of distinctly cephalic origin. One of these was in a mare which, if observed at rest in the stable, had every appearance of health, but which, when walked or trotted, showed marked evidence of motor paralysis involving principally the hind limbs. Respirations were slow and deep. There was incontinence of urine, and if the mare were turned round the urine was ejected in a jet. The urine was mucilaginous in consistence and on standing threw down a clot. On testing, it was found to contain 3 grammes of albumen per litre. The condition remained stationary for about 4 days, then the locomotor paralysis began to diminish and had disappeared by the 8th day, but there was no improvement with regard to the urinary system for a fortnight.

The authors consider that the symptoms presented indicate involvement of the lumbar cord, but in the absence of histological evidence they are unable to state that there were no lesions in the brain.

The majority of the cases observed (9 out of 15) were of the mixed type, and presented some of the symptoms described under the other two headings.

One of the most striking features of the cases when examined post-mortem was the extreme rapidity with which putrefaction occurred. The lesions are those of an acute septicaemia. The blood is black and uncoagulated, the vessels are engorged. There is pronounced congestion of the intestine. The liver is soft, the spleen enlarged and more or less diffluent. The kidneys are soft and moist. The lungs are congested and in some cases there is a blood tinged exudate. The mucous membrane of the respiratory tract has an appearance which suggests that it is covered with a layer of tar. The muscles are infiltrated and have a cooked appearance. The cerebro-spinal fluid is normal in appearance and quantity.

It is stated that the majority of post-mortem examinations have been carried out 24 hours after death, and that the authors consider that the lesions they described as being those of a septicaemia are in reality in the nature of secondary changes and not those of the disease itself. But they state that they draw attention to them because of their constant occurrence.

Histological examinations.—Lesions of the meninges are of rare occurrence and inconspicuous in character. The nerve cells of the cortex of the brain are surrounded by rounded embryonic cells. No cell-inclusions nor bacteria have been found in sections of the brain. The capillaries show in some places a perivascular infiltration with rounded cells, but it is exceptional to find more than a single layer of cells surrounding a capillary. The small veins are pronouncedly congested, and at places extravasated corpuscles may be found.

The fact that the authors had a mortality of 6 only out of 15 cases they attribute to the treatment adopted, and they point out that 4 of the 6 animals which died had no treatment.

All the cases, five in number, which showed evidence of involvement of the brain, died, and death took place in from 8 to 37 hours.

For treatment the authors used uroformine (Hexamethylenetetramine). Of this 15 grammes dissolved in tepid salt solution were injected subcutaneously twice daily. In two cases the injection was given intravenously. While it caused no disturbance it did not appear to act any better than by the subcutaneous path. It is important that treatment should be begun early.

Since death may occur very rapidly the authors attempted to find some means by which the disease could be detected before the development of clinical symptoms by taking the temperatures of the whole stud twice daily, but though some animals showed elevation of temperature they were unable to say that it was an indication of infection. They, however, took the precaution of injecting uroformine and in all cases the temperature returned to normal without any development of clinical symptoms.

As a protective measure all the animals in the particular group where all the cases had occurred were given 10 grammes of uroformine every other day in mash. This brought about a cessation of cases, but subsequently two mares from uninfected premises were introduced on separate occasions on to the infected premises and both contracted the infection.

In their experimental investigation of the disease the authors have avoided intracranial injections as being open to too serious risks and have adopted inoculation into the anterior chamber of the eye.

Inoculating rabbits in series the authors have found that the disease is transmissible to this species, and that a "fixed virus" can be obtained which is fatal in 4 to 7 days. On the other hand, that material derived from diseased horses does not invariably produce the disease in rabbits. The statement made is that of eight rabbits inoculated directly only two became infected. These eight rabbits appear to have been inoculated in two batches of three and five from two cases of the disease.

The symptoms in experimentally-infected rabbits are excitability alternating with depression. The head is extended and there is grinding of the teeth. Just prior to death there are observed tonic contractions involving especially the extensors of the limb.

Histological examinations have been made of the nervous system of one rabbit which died within a few days, and of one which lived for a fortnight.

In the first the most pronounced lesions were found in the pia mater, which was of marked thickness. It was filled with " haemorrhagic infarcts " and infiltrated with cells. Similar cells are found in the superficial layers of the cortical substance and the vessels in the same tissue show a peri-vascular infiltration. The nuclei of the pyramidal cells are excentric in position, and in some of them the chromophile granules are reduced to such fine particles that by Nissl's method the cell body appears to be clear. The choroid plexus was infiltrated.

No cell-inclusions have been detected. In the cerebellum the vessels of the nerve tissue itself show the same changes as those of the pia mater. The lesions found in the rabbit which survived for a fortnight were similar but less pronounced.

In neither case were any bacteria detected in the nerve tissue. In a single experiment an attempt was made to transmit the disease to guineapigs, but without success.

With an emulsion of the brain of a rabbit dead on the fifth day the authors inoculated a horse in the anterior chamber of the eye, and thereby produced infection. The temperature rose on the fourth day. The following day the animal appeared to be normal, but on the following morning it was down and unable to rise. There was evidence of excitement, the animal made galloping movements, and spasmodic movements of the head and neck.

The following day there was marked depression, and it was difficult to produce excitement by stimulation of any kind. Death took place within the next 24 hours.

The lesions found in the nervous system were those described in connexion with the acute natural cases.

An emulsion of the brain of this horse was injected into the anterior chamber of the eye of a rabbit. The rabbit died on the fourth day.

BORDEAUX (E. F. J.). **Bone Disease in Horses. A Clinical Study.**— *Jl. Comp. Path. & Therap.* 1924. Mar. Vol. 37. No. 1. pp. 27–37.

The author's observations lead him to think that dietetic errors which have up to the present been considered the chief cause of osteomalacia are not the only factors involved, and he suggests that it is the inability of certain animals to make full use of the mineral matters even when these are present in the diet. He refers briefly to some half-dozen cases in which the facts appear to suggest that there is an inherited tendency to the disease. The extensive use of bran and barley as a substitute for grass in bad seasons appears to have a distinct effect in causing the condition.

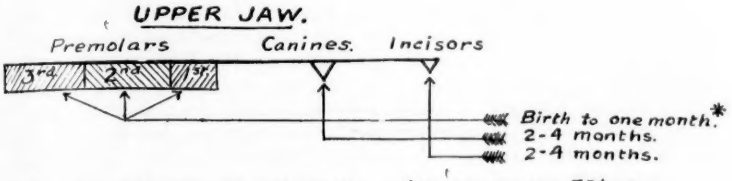
RABAGLIATI (D. S.). **The Dentition of the Camel.**—Egypt. Ministry of Agriculture. 1924. Cairo Govt. Press. pp. 1–32. With frontispiece, 2 graphs and 27 plates. [Price P.T. 5.]

While commanding a large hospital run entirely for the treatment of camels during the war, it was brought forcibly before the author's notice that the available information regarding the ageing of camels was either defective or inaccurate; he therefore set himself to gather as much information as possible on the subject. Since nearly 25,000

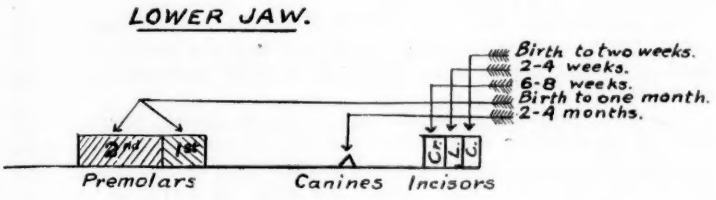
ERUPTION OF THE TEETH OF THE CAMEL SHOWN DIAGRAMMATICALLY.

TEMPORARY OR MILK TEETH.

Dental formula $\frac{1}{3}\ \frac{1}{1}\ \frac{3}{2} = 22.$

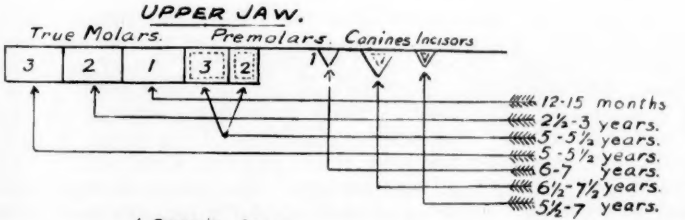


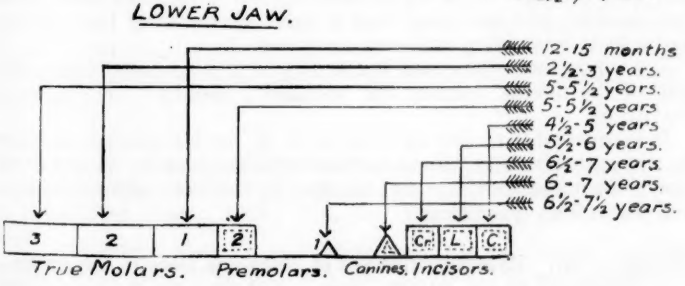
*The first two pairs usually appear a little before the 3rd pair



PERMANENT TEETH.

Dental formula $\frac{1}{3}\ \frac{1}{1}\ \frac{3}{2}\ \frac{3}{3} = 34.$





Note. Teeth shown thus ⬚ have temporary predecessors.

[After D. S. RABAGLIATI: "The Dentition of the Camel.]

camels passed through his hands he had good opportunity of gaining valuable knowledge of the subject. The present publication contains the information gathered and with the extremely good plates forms a veritable atlas of dentition in the camel.

An interesting point is referred to in the preface regarding the Arab's method of determining a camel's age. The period of gestation, which is a few days over a year, is counted as a year of life ; a camel is therefore considered by them as being one year old at birth. The author experienced considerable difficulty in finding camels whose age could be verified, as no breeding is carried on by the Government or by individuals upon whose statements reliance could be placed. Opportunity offered, however, of examining the mouths of a number of camels from the date of birth onwards until they obtained full mouths, but it was impossible to keep in touch with them in later life. In the case of camels whose age was definitely known the mouths have been examined every two or three months, and this has been possible in some cases up to six years of age.

The author has had no experience of the two-humped Asiatic camel, but he is of opinion that there is no material variation between the breeds, nor does he think that early maturity hastens the eruption of the teeth.

The teeth probably come through earlier in camels which have to fend for themselves, and apart from this it would appear that the variations in camels' teeth are more marked than in the other domesticated animals. The adult camel has only 34 teeth as compared with the 44 of the typical mammalian mouth. The teeth not represented are the two lateral and two central upper incisors, two upper and four lower premolars.

The camel appears to have no incisors in the upper jaw, but there are three pairs of tushes. The molars number five. In the lower jaw there are three pairs of incisors, two pairs of tushes, and four pairs of molars.

For the better understanding of the subject the author gives a brief but lucid description of the lips, cavity of the mouth, dental pad, hard palate, tongue, and soft palate. The salient points are these. The upper lip is cleft, and each half is independently mobile; it is prehensile. The lower lip tends to become pendulous with age. There is no muffle. The mucous membrane of the mouth is wholly or in part pigmented and very richly endowed with papillae. The dental pad is very hard and leathery. The tongue is smaller than that of the horse. It can be arched up at the posterior third of the free portion, and the camel has a habit of throwing this over the molar teeth when they are being examined.

The soft palate is long and in the male it is often protruded on each side of the mouth, forming the so-called " bladder " or " qula " of the Arabs.

It is impossible to deal in detail with all the information contained in the author's descriptions of the teeth at different ages, but the above diagrams indicate the changes in the conventional manner, and make them quite clear.

MAURESA (M.) **Hypersensitiveness of Philippine Dogs to Strychnine.**— *Philippine Jl. Sci.* 1923. June. Vol. 22. No. 6. pp. 567–580.

The belief has been held that dogs in the Philippine Islands are abnormally sensitive to strychnine, but experiments carried out by

the author indicate that there must be some other explanation of the untoward results obtained in practice as a result of the use of this drug.

WIRTH (P. H.). **Over arsenikhoudende dipvloeistoffen.** [On Dips containing Arsenic.]—*Nederl.-Indische Bladen v. Diergeneesk. en Dierenteelt.* Vol. 35. No. 1. pp. 20–28. [No date.]

One of the difficulties of dipping being the cost, Wirth has studied the local product containing As_2O_3 (named " Warangan "), from which he prepared an alkaline standard fluid containing 60 per cent. As_2O_3 (as Sodium arsenite) and which, by diluting 1 : 250 contains 0·24 per cent. As_2O_3. The price is $1\frac{3}{4}$ guilders (Dutch value) per kilogram, As_2O_3.

Experiments were undertaken to ascertain under what conditions the dip deteriorates (*i.e.*, diminution of the As_2O_3 content by oxidation to As_2O_5, reduction to AsH_3 or absorption by the concrete wall of the bath).

It is shown that faecal pollution reduced the As_2O_3 content to practically nil within a month or a little longer. Addition of ·01–0·05 per cent. of creoline or covering of the surface of the liquid by oil, does not prevent this deterioration. The deterioration is favoured by an alkaline reaction.

In a dipping-fluid containing free As_2O_3 and sodium sulphate the deterioration caused by faecal pollution can be prevented by the combined action of 0·05 per cent. creoline and an oil covering. This is the only dip to be recommended in practice. If an alkaline dip should be judged necessary the fluid should be alkalinized before use and acidulated again afterwards, or the cattle can be given a preliminary dip of an alkaline soap solution, which, moreover, counteracts the pollution of the arsenical dip.*

CALMETTE (A.) **Sur l'utilisation des singes en médecine expérimentale. Le Laboratoire Pasteur de Kindia (Guinée Française).** [The Utilisation of Monkeys in Experimental Medicine.]—*Bull. Soc. Path. Exot.* 1924. Jan. 9. Vol. 17. No. 1. pp. 10–19. With 1 text fig.

The author describes the establishment in French Guinea of a special breeding station for monkeys to be utilized for experimental investigations in connection with diseases that cannot be transmitted to other species. Details are given of the various monkeys which will be available and information is afforded regarding management, etc.

CERNAIANU (C.). **Le Liquide hydatique comme milieu de culture pour les microbes.** [Hydatid Liquid as a Culture Medium for Bacteria.] —*Archiva Veter.* 1923. Vol. 17. No. 415. pp. 85–86.

The author finds that liquid from hydatids can be used as a culture medium in the place of broth or as a basis for agar. It is not coagulated by heat and can be sterilized in the autoclave at 120° C.

* Summarized by Dr. N. H. Swellengrebel.

A list of organisms cultivated is given. The bacillus of fowl cholera appeared to grow less abundantly than in ordinary broth. The bacilli of avian and human tuberculosis do not appear to grow at all on agar prepared with hydatid liquid.

BRASCH (H.). **Versuche über die klinische Verwendbarkeit des Oxydiphenylmethans " Allegan-Bayer " des Wurmmittel.** [Oxydiphenylmethane " Allegan-Bayer " as a Vermifuge.]—*Arch. f. Wissensch. u. Prakt. Tierheilk.* 1923. May. Vol. 49. No. 6. pp. 264–272.

In doses of 0·05 to 0·2 g. per kilog. body weight, Allegan is likely to cause slight swelling and reddening of the mucous membrane of the stomach and duodenum. These doses are well tolerated, and no albuminuria is caused by them in healthy animals. With doses of 0·4 to 0·8 per kilog. severe gastritis and acute parenchymatous nephritis may be caused. Albuminuria and weakness of the hind quarters are sometimes observed. With still larger doses slowing of the pulse, lowering of the temperature and slowing of respiration occur. A dose of 1 g. per kilog. may be fatal in 8 to 10 hours in animals suffering from gastro-enteritis.

Doses of 0·05 g. per kilog. were found to be effective for the destruction of ascarides, Taeniae, oxyurides and ankylostomes. 0·2 g. per kilog. was found to be ineffective against *Mesocestoides lineatus*. The killed worms are to some extent digested and this is not without risk to the infested animals, on account of absorption of toxic materials. Allegan is therefore combined with Istizin (? a purgative). On account of its sharp taste the drug produces an increase in the secretion of saliva and may cause vomition: it is therefore given in capsules. Great caution must be exercised in giving the medicament to cats on account of an apparent special susceptibility. It was found that 10 grammes was too small in two cases in which it was tried on horses.

QUIROGA (S.). **Experiencias sobre un medio de cultivo de origen vegetal.** [Experiments with a Culture Medium of Vegetable Origin.] —*Revista Zootecnica.* 1923. June 15. Vol. 10. No. 117. pp. 161-165.

REPORTS.

TANGANYIKA. **Annual Report of the Department of Veterinary Science and Animal Husbandry. 1922.** [MCCALL (F. J.) Chief Vet. Officer.]—30 pp. With 1 folding map. London: Crown Agents for the Colonies. [Price 3s. 6d.]

During the period reviewed by the report rinderpest was widespread and was the most serious problem to be dealt with. All territory south of the Central Railway was kept clear of it. The disease was generally of a mild type, but there were exceptions among animals which have been free from the disease for some years. The factors in the spread of the disease are illicit movements, infection of common watering places, especially the almost ubiquitous standing water, infection of susceptible game.

The disease has been recognized in the bush buck and wild pig, but these animals do not appear to travel far when infected. Eland, however, travel long distances. It has not been detected in the giraffe, although these animals are known to be susceptible, and they are present in large numbers in the Masai cattle country.

The movement of meat and skins of cattle dead of the disease is partly responsible for its spread.

It is still held that double inoculation is an unsuitable method of control. Serum alone is preferable in small outbreaks which are promptly reported. Quarantine alone would effect the stamping out of the disease if an adequate trained staff were available to ensure early detection and to enforce the rules laid down.

The average dose of the serum supplied from the Kabete Laboratory per animal was 31 cc.

Investigations appear to indicate that East Coast fever is not so enzootic as in Kenya and Uganda.

Dipping is still proving successful in Dar-es-Salaam, where local dairies are making progress. The death rate from East Coast fever among grade and pure bred imported cattle is negligible.

It is hoped to publish a map indicating clean, infected, and endemic areas at an early date.

Fly belts are being defined with greater accuracy and recessions and encroachments detected.

Contagious bovine pleuro-pneumonia has been confined to the northern half of the Arusha district.

Vaccination has yielded disappointing results.

Extracts from the First Preliminary Report of the Veterinary Pathologists, Mpapua, for the year ending December 31st, 1922 :—

The Veterinary Pathologist reports in connexion with the preparation of anti-rinderpest serum that in the process of hyperimmunization the practice of the Germans was to transfuse direct from the carotid of the virus producer to the jugular of the serum-maker. " Apparently they did not practise much re-hyperimmunization." The reason for this was that they considered that the losses due to shock, amounting to 6 per cent., were more than compensated for by the labour saved. But while this is the normal figure for mortality at the first hyperimmunization, it rises with each successive re-hyperimmunization until it becomes prohibitive. Hornby tried the effects of calcium chloride and sodium thiosulphate in reducing this shock, which, although not fully understood, is probably anaphylactic in nature. Of 25 animals hyperimmunized without the drugs, 8 per cent. died. Of 84 which received calcium chloride at the same time as the transfusion, 4·8 per cent. died. Of 57 hyperimmunized, re-hyperimmunized and given the thiosulphate at the same time, 3·5 per cent. died of shock. Concurrently, experiments were made in which the hyperimmunizing blood was transfused into the peritoneal cavity and into the rumen. Carefully controlled tests of the relative titres of the sera produced in the three different ways were carried out. The results indicated that a potent serum can be made by all of these methods or even by drenching a serum maker with virulent blood, but that to get a serum of the same titre relatively more virus would have to be administered. The serum obtained by the intraperitoneal method was at least as good as that obtained by intrajugular injection, and none of the 32 animals hyperimmunized and re-hyperimmunized in this way showed more than transitory symptoms of shock.

The reason for not employing the intraperitoneal route solely is to avoid wounding the serum maker always in the same place. Hornby states that two Europeans, assisted by the necessary boys, can in a morning hyperimmunize 26 animals: 18 intraperitoneally by transfusion, 6 intrarumenally by transfusion, and 2 intrarumenally by gravitation.

Each hyperimmunized is bled 10 days after receiving the fortifying dose at the rate of 5 cc. per lb. body weight. This is repeated weekly until he has been bled five times. The animal is then sent away to recuperate.

The blood is allowed to clot and stand for 24 hours. It then has weights placed upon it and after 48 hours the serum is syphoned off into closed milk churns. It is then carbolized. When not less than 300 litres are available the mixed serum is filtered through charcoal into ordinary sterilized milk bottles.

It has been found that 30 cc. per 600 lb. body weight is sufficient to protect against a simultaneous injection of 2 to 5 cc. of virulent blood. The serum is therefore issued in this dose.

On a number of occasions 3 to 5 times the protective dose of serum has been given to animals a day or two after they have begun to react to a dose of virulent blood. Of 35 animals injected 28 per cent. died. Of 14 controls not injected, 85 per cent.

In a single instance in which some pleuropneumonia virus received from Kabete, Kenya, was used for the inoculation of susceptible cattle entirely negative results were obtained. The fortnight's journey in the hot weather had killed the virus. This indicates that a laboratory prepared vaccine is not likely to yield good results unless used very shortly after preparation.

East Coast Fever.—Tartar emetic, picric acid, and brilliant green were found to be useless for treatment. A native calf severely affected with follicular mange was treated by subcutaneous injection of 2½ per cent. solution of carbolic acid. Six injections of 50–60 cc. were given wherever the lesions were worst. Only a temporary swelling followed the injections and after the last injection no active lesions presented themselves.

JAVA. **Jaarboek van het Departement van Landbouw, Nijverheid en Handel in Nederlandsch-Indië.** 1922. [Annual Report of the Department of Agriculture, Industry and Commerce, Dutch East Indies, 1922.]—1923. 271 pp. Weltevreden: Landsdrukkerij. [Price f. 3.]

Special information concerning the following diseases is to be found in this report :—

Glanders. 10,280 cc. of mallein provided for the ophthalmoreaction. In Surabaya alone 2,743 horses were examined in this way, because it was feared that this port might constitute a focus of infection for other districts not infected till now.

Tuberculosis. 7,911 cc. tuberculine B (for subcutaneous tuberculinization) were provided to the local veterinarians.

Septicaemia haemorrhagica bubalorum. 250,175 cc. antiserum and 90 cc. killed vaccine were provided. The serum is standardized to protect, in 2 cc., a rabbit against 5 times the fatal dose (killing within 20 hours). Veterinarians unanimously reported favourable results with this serum.

Lymphangitis epizootica. Experiments on immunization with Cryptococcus-vaccine yielded no clearly favourable results.

Cholera gallinarum. A beginning was made with the preparation of antiserum.

Anthrax. 81,025 cc. antiserum were issued. An extensive epidemic on the island Roti was brought to a stop by serum treatment. Of vaccine made of the spores of Bac. anthracis (1 million spores per cc.) 4,365 cc. were issued.

Malignant oedema. Experiments in connexion with vaccination were conducted on an extensive scale, 732 animals were vaccinated with mixed serum-vaccine of LECLAINCHE and VALLÉE, 1,042 animals with sterile filtrate of *Bac. oedematis maligni*. In both groups the mortality due to this disease was much less (0·33 and 0·25 per cent.) than among non-vaccinated cattle. A cow immunized with the filtrate 7 months ago was resistant to an infective dose killing a normal animal within 24 hours. In 1922, 58,300 cc. of filtrate, 80,875 cc. of antiserum, and 3,990 cc. of vaccine were distributed among local veterinarians.

Surra. Attention was concentrated on "Bayer 205." Its therapeutic effect on horse-surra was not of lasting value (no relapse after 16 months) except in cases recently infected. No permanent results were obtained in cases of longer duration. As this chemical compound is highly poisonous, with marked idiosyncrasy, no higher doses could be used than $\frac{1}{2}$ gram per 150–200 kilograms on alternate days for 20 days (10 grams altogether). The prophylactic value was well marked in a dose of 1 gram per 150–200 kg. once in 4 weeks. In acute surra among bovines encouraging results were obtained.*

* Summarized by Dr. N. H. Swellengrebel.